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The Chartered Surveyors' Institution

SESSION 1944–45.

AT THE ORDINARY GENERAL MEETING

Held at the Chartered Surveyors' Institution on Wednesday, 25th April, 1945.

Mr. A. G. HARFIELD (Vice-President) in the Chair.

NEW MEMBERS.

The following members were received by Mr. Harfield, representing the President, prior to the meeting and signed the Register :—

Professional Associates :

BELL, OSWALD (CAPTAIN)
BUZZACOTT, JAMES OLIVER
DOUGLAS, VICTOR CHARLES
LATHAM, JOSEPH BERNARD
LOTHIAN, STANLEY DAVID PATERSON
POUNTNEY, MOLMORE (MISS)
RICHARDS, CYRIL EDWIN WHITFIELD
ROBINSON, FREDERICK RICHARD
SCANNELL, RONALD JAMES WILLIAM
WOOD, NORMAN BURREN

The following PAPER was read by Major-General G. CHEETHAM, D.S.O., M.C., Director-General, Ordnance Survey.

THE POST-WAR PROGRAMME OF THE ORDNANCE SURVEY WITH SPECIAL REFERENCE TO LARGE SCALE MAPS.

By Major-General G. Cheetham, D.S.O., M.C.,

Director General, Ordnance Survey.

In 1938 the committee to investigate the activities of the Ordnance Survey, presided over by Lord Davidson, issued its final report. One of the terms of reference of this committee was " to review the scales and styles of Ordnance Survey maps placed on sale to the public and to recommend whether any changes are desirable."

The committee took evidence from a large number of individuals and institutions, including your own Institution, and the programme which I am going to describe to-night is based on those recommendations of the committee which are considered suitable for adoption under present conditions. I hope that I shall get constructive criticisms from members of the Institution which will help me to ensure that the new maps as nearly as possible meet the needs of their users. It must, however, be remembered that one man's meat is another man's poison and consequently maps designed to serve the country as a whole, in its work and in its play, must be based on a compromise intended to meet most of the requirements of all users.

One of the most important considerations in framing the programme has been the need for speed in supplying the maps. I would ask, therefore, that criticisms and suggestions should be aimed at the methods employed to carry out the recommendations of the committee rather than at those recommendations themselves. They were arrived at after very careful consideration of the evidence supplied by a large body of instructed opinion and could only be modified after a similar careful investigation which would cause intolerable delays. I propose, therefore, to indicate which parts of the programme are definite recommendations of the committee and which are the Ordnance Survey's own proposals for carrying out those recommendations.

I am devoting most of the time at my disposal to describing the work on the Large Scale Plans, as I believe this is the part of the programme which is of most interest to the members of your Institution. As, however, the whole programme of the Department is aimed at producing a system of maps and surveys on all scales, which form a co-ordinated whole, it is desirable to start with a short description of the basis of the survey and of the Small Scale maps in order to show how the Large Scale Plans fit into the general picture.

The basis of the existing maps of this country is the principal triangulation which was carried out over a number of years about 1800. To this principal framework was attached a secondary and tertiary system. The tertiary framework, which covered the country with a network of triangles whose sides were two to three miles long, formed the basis to which the detail survey of the country was adjusted.

The original Large Scale maps were published upon a county basis and consequently it was decided to adjust this tertiary triangulation on the basis of individual counties, or of groups of counties, without any reference to the survey of the adjacent areas. The positions of the points were computed in rectangular co-ordinates in the Cassini projection based on a county meridian. This projection is quite suitable for work over these limited areas but introduces distortions which become intolerable if the area projected is extended to cover the whole of Great Britain.

The existing Large Scale series, although described as a map of Great Britain, could consequently be more accurately described as maps of the counties of Great Britain. Any attempt to work across from the maps based on one meridian to those based on another meridian was attended by considerable difficulties.

The One Inch map, upon which the smaller scales are also based, was projected upon a Cassini projection whose origin was the Ordnance Survey Trigonometrical Station at Delamere in Cheshire.

To replace this system, or rather these systems, the Davidson Committee recommended that the 1/2,500 plans and all smaller scales, should be re-cast

on national instead of on county sheet lines. This involves plotting the work on a projection which does not introduce intolerable distortions when extended over an area the size of Great Britain. The projection adopted was the Transverse Mercator with Central Meridian 2° W. and with its origin at 49° N. This projection has the property that the scale is correct at any point on its Central Meridian. At points East or West of the Central Meridian the scale is greater than that on the Central Meridian and the excess of the local scale over the correct scale is known as the Scale Error.

In order to reduce the maximum amount of the Scale Error at any point in Great Britain, the scale on the Central Meridian is reduced by 2499/2500. This has the effect of making the scale on the meridian of 2° W. 004 per cent. too small and the scale on the east and west coasts about 004 per cent. too large. At a distance of about 180 kilometres east and west of the Central Meridian the scale is correct.

This maximum Scale Error has no appreciable effect on the representation of topography on the 1/1,250 scale even at the limits of the projection. It has, however, an appreciable effect on the computation of areas on the 1/2,500 plans, but as the error is sensibly constant over any given plan and is not affected by the shape of the parcel, a simple correction can be made by multiplying all areas by a factor which will be constant for any given plan.

Finally, in order that points which are west of the origin may not have negative values, 400 kilometres is added to the east-west co-ordinates, and to enable the whole of the mainland of Great Britain to be included without exceeding 1,000 kilometres, a figure of 200 kilometres is subtracted from the north-south co-ordinates. This places the " false origin " of the projection a little to the south-west of Lands End.

The Davidson Committee recommended that a National Grid should be superimposed on all Large Scale Plans and on all smaller scale maps, with certain exceptions, to provide one reference system for maps of the whole country, and that the international metre should be adopted as the unit upon which the grid should be based.

This National Grid is a means of facilitating the reading of the rectangular co-ordinates of any point measured from the false origin of the projection. It consists of a series of lines drawn parallel to the axes of the projection. The distance apart of the lines shown on any map depends upon the scale of the map. Thus on the One Inch, 1/25,000 and Six Inch maps the distance adopted is 1 kilometre, while on the Quarter Inch and Ten Mile scale sheets it is 10 kilometres. On the 1/2,500 and 1/1,250 scales the distance is 100 metres.

From these lines it is possible to obtain the co-ordinates of any point with an accuracy depending upon the scale of the map. Thus on the One Inch scale the figures printed in the margin against a line will give the value to the nearest kilometre and the position of a point may be estimated, or measured, between a pair of lines to the nearest 100 metres.

In order to use the grid for reference purposes it is necessary to adopt some systematic method of using the co-ordinates. Any persons who wish to collaborate in the use of the grid must clearly use the same system. It has, therefore, become necessary for the Ordnance Survey to recommend a particular system and the figures printed on the margins of its maps have been designed to use this particular system. It is open to any map user who finds the system unsuited to his requirements, to devise his own system, as the grid

is intended to be a servant, not a master. In designing the Ordnance Survey system the following points were borne in mind :—The system must be

(1) Universal for the whole of Great Britain ;
(2) As precise as may be thought necessary on large scales ;
(3) Not too cumbrous ;
(4) Absolutely definite in its meaning.

We were unable to find any one system which fulfils all these requirements on all scales and have consequently adopted two systems, one for use on large scales and the other on medium and small scales. Usually the context will indicate which type of reference is being used, but the form of reference also gives a clue if this is necessary.

Small and Medium Scale References.

The type of reference advocated is essentially the army system. It has been decided, however, to use two figures and an oblique stroke instead of the two letters used in the army system. The views of a large number of institutions and individuals have been obtained about this system and they are generally favourable.

With this system the position of a point is identified as follows :—

Take a point whose co-ordinates are	E 538932	N 177061
By adopting the convention that Eastings must always precede Northings, we may drop the letters E and N	538932	177061
For most purposes it is sufficient to know the position to within 100 metres, which is the most accurate fixing possible on a One Inch map. We may, therefore, drop the last two figures which represent tens and single metres	5389	1770
If the district in which a point lies is known we are not likely to confuse it with another point 100 kilometres distant. We may, therefore, drop the first figure of each co-ordinate	389	770

The six figures which are now left form what is known as a Normal National Grid Reference.

To obtain this reference from a Small or Medium Scale map, first obtain the Eastings by reading the large figures in the margin of the map printed opposite the north and south line which bounds the west edge of the square in which the point lies. This gives the first two figures of the reference. Then estimate tenths inside the square towards the next line to the east, this gives the third figure and completes the Easting part of the reference. A similar process gives the three Northing figures and completes the whole reference.

In order to make the reference unique throughout Great Britain, it is necessary to reintroduce the figures representing 100's of kilometres. This is done by inserting these figures together at the beginning of the reference and separating them from the normal reference by an oblique stroke. This is known as a full National Grid Reference.

In the case above it is 51/389770.

Where the location of a point need only be defined to an accuracy of 1 kilometre, the figures representing hundreds of metres may be dropped,

giving a four-figure reference as 3877. As, however, in such cases it is likely that a considerable area of country may be under consideration, the Full Four Figure reference is likely to be widely used, i.e., 51/3877.

Four Figure references are easily read from Quarter Inch and Ten Mile maps. In the above case the figures 5 and 1 are printed small in the margins opposite the 100 kilometre grid lines and are also shown in a diagram showing the incidence of the grid lines on the country as a whole. The figures 3 and 7 forming part of the normal reference are printed large in the margin opposite the ends of the 10 kilometre grid lines. The figures 8 and 7 are obtained by estimation inside the 10 kilometre square on the map.

The effect of the above system is to divide the country into squares of 100 kilometres side numbered by the co-ordinate values of their south-west corner in hundreds of kilometres. Inside these squares the Normal National Grid Reference is read.

Large Scales.

On the Large Scale Plans references will be required to indicate positions to the nearest 10 or even single metre. If an attempt is made to make such references uniform with small-scale references by starting with the figure representing tens of kilometres, we shall be involved with 10-figure references. Thus the example already used would give a large scale reference of 3893277061. It is thought that such a system would be altogether too cumbrous for ordinary use. We have, therefore, advocated the use of two- or four-figure references inside each 1/2,500 plan. As will be seen later, these plans are kilometre squares and are numbered by the Full Four Figure reference of their south-west corners. The large-scale reference would accordingly become 9306 and would be on Plan 51/3877.

The following alternatives to the above system have been suggested.

That all grid references should start with the full value of the co-ordinates including the hundreds of kilometres. Each half of the reference would consist of any number of figures from 2 to 6, according to the precision with which definition was required. It was also suggested that this system might be modified by showing references to the nearest kilometre and placing a further reference in metres after an oblique stroke. This would make the reference used above 538177/932061.

This would have the advantage that the first set of figures defines the kilometre plan in which a point lies and the second the reference inside the plan. The method has definite attractions but the balance against it was tipped over by the fact that it is totally different from the army system. By using a system essentially the same as the army, we secure the advantage that many people are already familiar with it, that instruction in civilian schools and in the army will be on the same lines, and that a large amount of work is saved in producing civil and military editions of the same maps.

It has then been suggested that the National Grid should copy the army system exactly. This was rejected for the following reasons :—the two systems are so similar that instruction in the one is, to all intents and purposes, instruction in the other and, for the same reason, the amount of extra work due to the difference between the systems in preparing a military edition of the map is practically negligible. On the other hand, the public show great reluctance to accept additional material superimposed on the surface of the map. It is nearly impossible to indicate the position of the military letters

on small scale maps without such an overprint, whereas the figures of the National Grid appear in a regular manner in margins, as will be apparent as the individual maps come to be discussed.

The use of the grid as a reference and filing system is already beginning to be appreciated by a growing number of map users. Several instances of its use by the Ordnance Survey will come to light during descriptions of individual maps. For instance, it is used as a convenient indexing and filing system for all maps on scales larger than One Inch to the Mile. It is also proposed to use it for filing Bench Mark values and for numbering the parcels on the 1/2,500 plans.

These are a few instances in which the map user will become aware of the convenience of the system. The saving of time inside the Ordnance Survey by using the grid as the basis of all our records is enormous. If this is true of the specialised requirements of the Ordnance Survey I believe that other map users will find it an equally useful servant.

A general illustration of the benefits of the universal system of reference provided by the grid compared with older systems, is given by the Table below which shows the references on the grid of Salisbury Cathedral compared with the reference on earlier editions of Ordnance Survey maps.

MAP REFERENCES.

Salisbury Cathedral Spire.

———	Old System.	National Grid.
Full Co-ordinates	— 41962·11 EAST + 49859·53 NORTH	414298·31 EAST 129532·12 NORTH
10 Mile	T 9	41/1429
¼ inch, 3rd Edn. Sheet 11 ...	E 9	41/1429
¼ inch South Central Sheet ...	O 4	41/1429
½ inch Sheet 38	B 4	41/142295
One Inch Pop. Edn. 122 ...	H 7	41/142295
One Inch Salisbury Plain Special Sheet	K 10	41/142295

The principal small-scale maps which it is proposed to publish are as follows :—

(1) *The* 1/1 *Million* in the same style as the pre-war map " In the style of the International Map" but with National Grid lines superimposed at 100 kilometre intervals.

(2) *Ten Miles to the Inch* in the same style as pre-war publications but with National Grid lines at 10 kilometre intervals substituted for the yard grid.

(3) *The* 1/625,000 *map* with grid lines at 10-kilometre intervals. This map, which has already been produced in two sheets, is an outline map in one colour and is used principally as the basis upon which we are publishing for the Ministry of Town and Country Planning a series of maps illustrating special features, such as Land Utilisation, Population Density and Communications.

The map has already proved valuable inside the Ordnance Survey as a complete index to the 1/25,000 series mentioned below, because the squares of the 10 kilometre grid represent the sheet lines of that series.

(4) *Quarter Inch to One Mile.* This will be the pre-war 4th Edition revised and with National Grid sheet lines at 10-kilometre intervals substituted for the yard grid.

(5) *One Inch to the Mile.* In England the 6th Edition* is on standard sheet lines, 40 kilometres by 45 kilometres. Its general design is similar to that of the pre-war 5th Edition but it shows the National Grid at 1 kilometre intervals in place of the yard grid at 5,000 yard intervals. The One Inch scale is a difficult one on which to show a grid either in yards or metres. An interval of 1 kilometre tends to crowd the map, while one of 10 kilometres is too wide to be used conveniently for referencing. The use of divisions which are not multiples of 10 is also not convenient for that purpose. On this map a compromise has been sought by using fine dotted lines for the kilometres and firm lines for the 10 kilometres. It is hoped that the result will enable the grid to be used without obscuring detail. As already noted, the squares of the grid represent the sheet lines of the new 1/2,500 Plans and the map consequently forms a complete index to those plans.

In the north of England no newly-drawn material is available for the immediate production of this series and to re-draw the sheets would take several years. Consequently, a Provisional Edition* is being prepared from the Popular Edition by direct photography of the copper plates and revising.

In Scotland the Popular Edition* is being revised and republished with the National Grid added.

The Davidson Committee recommended that steps should be taken to publish the One Inch map as well as the maps on smaller scales, in both gridded and ungridded editions. Steps are accordingly being taken to make it possible to produce an edition without the grid. It is hoped, however, that there will be no pressure to produce this edition immediately as this can only be done by slowing down the production of the map.

The map will be produced in two styles, " fully coloured," showing outline in black, water in blue, contours and second-class roads in orange, first-class roads in red, and woods in green, and " outline," with the detail and water in black and the woods in grey. In the case of the Provisional Edition the wood symbols as shown on the Popular Edition will replace the grey.

Until the new 6th Edition sheets are published, permission has been obtained from the War Office to issue the Military One Inch map to the public. This map incorporates all the revision available to date. It also incorporates the Military Grid which is totally different from the National Grid and consequently does not act as an index to the sheet lines of the Large Scale Plans. The Military series is on the sheet lines of the Popular Edition. It is distinguished by the following title " Second War Revision 1940."

I may add that all maps incorporating the National Grid have the words " National Grid " printed either on the cover or in the margin of the map.

* Specimens of the maps marked with an asterisk can be seen in the Institution's library.

Medium Scale Maps.

A new map at a scale of 1/25,000, or approximately 2½ inches to the mile, is to be published. The sheets of this map will be squares of 10 kilometres side and will be bounded by National Grid Lines. The sheets are numbered by the Full Four Figure references of their south-west corners. This enables the 1/625,000 and Quarter Inch maps to be used as indexes to the series.

In the first instance, a Provisional Edition made up from existing material, will be published. As this is on the same sheet lines as the final map to be produced by reduction from the new large-scale survey, it will be possible to replace the Provisional Edition by the Final Edition sheet by sheet. The contours, which are at 25-ft. V.I. are not all instrumental. It is intended to survey the contours before the Final Edition is published.

The design of the map is still experimental. In the first design prepared* nearly all the detail which appears on the Six Inch map in rural areas is shown. It has been found necessary to draw all the smaller roads to a gauge instead of showing their true shape. In towns some of the detail shown on the Six Inch map has to be conventionalised. The roads in the towns have been shown as reductions of their representation on the Six Inch map. Road names have accordingly only been shown where the size of the road permits this to be done without distorting the size of the road. The method of showing houses is at present under review. On the first model this was done by hatching and by showing public buildings in black. An experiment is now in hand in showing the buildings by a grey filling and the opportunity is being taken to show some of the less important details in grey instead of in black.

It is proposed to show the position of Bench Marks only in open country and even there not to insert their heights. The state of the levelling of the country is at present in some confusion, owing first to the change-over from the Liverpool to the Newlyn Datum and, secondly, to the loss of some of our records during the war. These matters will be gradually straightened out as the new levelling on the Newlyn Datum is completed. It seems probable, however, that frequent re-levelling will be required in the areas where subsidence is taking place. Thus during the time we are completing our records based on Newlyn, and probably thereafter, at least in the subsidence areas it will be desirable to make provision for publishing levelling information at frequent intervals. We are now considering doing this by issuing lists corresponding to the sheets of the 1/25,000 map. These lists would give the grid reference of the Bench Mark, the level value, the datum and, where available, the Bench Mark description and height above ground level. The grid reference will locate the point to the nearest 10 metres and it is consequently intended that in town areas the lists should be used in conjunction with the larger scale plans, whereas in country areas the 1/25,000 may suffice. It should be possible to produce such lists much more frequently than it is possible to publish new editions of maps. As, however, their production involves a considerable amount of work, I should be glad to know if they are likely to be in great demand by the surveying profession.

Six Inch Map.

The Davidson Committee recommended that the new Six Inch map should be published on square sheet lines with sides 5 kilometres by 5 kilometres,

every sheet forming a quarter of a 1/25,000 sheet. The design of this map has not yet been considered in detail.

As it will take a number of years to complete the final Six Inch map, which will be produced by reduction from the new large scale survey, it has been decided to produce a Provisional Edition made up from the existing Six Inch map on its present sheet lines.

After an investigation into the discrepancies between the old and new framework, it was decided that no intolerable errors would be introduced by superimposing the National Grid upon the old sheets of the Six Inch map.

In 1938 a special emergency edition of the Six Inch map was produced. This included a revision of the built-up areas by hasty means and was reproduced by methods whose speed did not permit of production to a very high standard. This edition was issued only to local authorities for A.R.P. purposes. The revision carried out in 1938 is now being incorporated in the Provisional Edition of the Six Inch map and, at the same time, the National Grid is being added. At the time that this work was started it was not possible for security reasons to publish maps incorporating the National Grid. The sheets published at that time either have marks in the margin indicating the cutting lines of the grid, or have the whole grid superimposed, but in both cases without any indication of the numbering of the grid. County diagrams are being prepared showing the incidence of the grid upon the old Six Inch sheet lines and these will enable the grid figures to be filled in. The information may also be obtained by writing to the Director-General of the Ordnance Survey, Chessington. The grid lines on the first sheets* to be produced were drawn continuous but in order to prevent any confusion with the hedges, this has now been changed to a fine dotted line.*

It is hoped that this series in conjunction with the mosaics described later will help to fill the gap until the new survey can be published.

Large Scales.

The Davidson Committee recommended that when the revision of the 1/2,500 plans required in connection with the Town and Country Planning Act was complete, further investigations should be carried out with a view to establishing whether the requirements of the urban areas would not be more adequately met by a survey on the 1/1,250 scale. The required revision had been practically completed by the beginning of the war although it has not been possible to publish all of it owing to shortage of staff and to the loss of some of the material which has been destroyed during the war. There are some three thousand plans which remain to be published incorporating revision up to 1938/40. The publication of these plans on the old sheet lines will proceed as fast as staff can be found to carry out the work.

During the war only a very small fraction of our Field Staff has remained at work in this country and revision of the large scale plans has practically ceased.

A beginning was however made in Bournemouth to see whether the 1/2,500 plans in an urban area could be " overhauled " or whether re-survey would be necessary. Bournemouth was selected because, in addition to being near our headquarters at Southampton, it is not only close to a county boundary but part of the area had been transferred from one county meridian to another. A study could thus be made of the effect of changing the framework of the survey from one system to another. In addition, Bournemouth has grown very rapidly since the original survey and the accuracy of revisions

built-up on the detail of a rural survey could be assessed. As a result it was found that re-survey was essential and that being so it was decided that this should be at 1/1,250 rather than at 1/2,500.

Many claims have been made that the new survey should be at 1/500. This had, however, already been considered and reluctantly rejected by the committee.

Bournemouth was then treated as an area in which to experiment in the execution of a 1/1,250 survey and its reproduction at that scale and at 1/2,500. The small Field Staff available, with the exception of a few surveyors in Scotland, was concentrated on the work in the hopes of getting a well-tried procedure, both for the survey and its maintenance by continuous revision, in operation before the Ordnance Survey staff began to return at the end of the war.

As a result of our experience the following is an outline of the procedure we propose to adopt. The first stage is the completion of the block of secondary triangulation. The next is the reconnaisance and observation of the local control. This includes both the tertiary triangulation and the main traverse framework. This main traverse framework is laid out so as to break up the town into areas which will enable the work to be carried on by minor traverses not over 1 kilometre in length. Its layout is primarily governed by the position of the triangulation framework upon which it depends and only secondarily upon the convenience of the detail surveyors who follow. The work is carried out by the Trigonometrical Division.

A representative of the Field Division then studies the layout and working back from the position of his detail survey lines, decides how his minor traverses shall be run and how they are to connect to the main traverse framework. At this stage some adjustment may be made to the layout of the main traverse framework to meet the convenience of the detail survey; the detail points to be fixed during the survey of those traverses are also decided upon.

The main traverse framework is then surveyed, computed and adjusted as one whole, and the values are handed over from the Triangulation Division to the Field Division who are responsible for the rest of the work.

The Field Division next carry out minor traverses which are adjusted individually between control points on the main framework or on previously completed minor traverses.

The traverses are used to fix the co-ordinates of points known as Revision Points (R.P.'s) on which the main lines of the detail survey will depend. These R.P.'s are topographical features, such as corners of houses or junctions of walls, sometimes supplemented by a mark such as a pipe nail. They are always sited in groups and sketches* of the group are made with accurate dimensions shown between the individual points. It is hoped by this method and by the assistance of Borough Engineers, to be able to identify sufficient points at any future date to ensure that one position in a group can be re-established.

These sketches are required for internal purposes in the Ordnance Survey and it is proposed to make them available with their co-ordinates for Borough Engineers and others who may wish to carry out large-scale surveys of a small area. The co-ordinates of these points will be available some considerable time before the survey of the 1/1,250 can be published. The accuracy of the co-ordinates is sufficient to enable a 1/500 survey to be based on them.

The normal methods of chain survey are then employed to supply a skeleton of the detail, the main detail lines being chained between R.P.'s. It is possible that this process, and all succeeding ones, will be radically altered if some experiments in the use of survey from air photographs are successful. For the present, however, we shall be using the methods now described.

The Field document for use by the surveyor on the ground is prepared as follows :—The document itself consists of a square anodised aluminium plate of 20 cm. sides. The sides of this plate are machined so that they can be used as grid lines from which the plotting can be carried out. We specify that there shall be no error in the plate as great as ·01 of a cm. A convenient number of plates are fixed down together on a drawing table and owing to the accuracy of the machinery, they fit together to form one drawing surface. The positions of the R.P.'s are then plotted by co-ordinatograph.

The skeleton chain survey is plotted and adjusted to the R.P.'s and the plates are ready for issue to the Field. This skeleton survey is plotted in red.

On the ground the examiner completes the detail in black on the basis of the skeleton detail survey, using the usual methods. He works on a sketching case to which the four plates forming a 40 cm. square are attached. The fact that he can have *any* four plates on his case practically eliminates all difficulties due to working across edges. When he comes to an edge of a plate he has a ready means of transferring that edge to the centre of his case.

There is not the time to describe the methods of drawing and reproduction used. The following points are, however, of interest. At no stage of the survey or reproduction is the work carried out on paper or any similar material which introduces distortion. It is reasonable to hope, therefore, that the work on the printing plate is sensibly accurate apart from personal errors which, however, we take great trouble to eliminate. When revision is required, the document to be sent to the Field will be a metal plate prepared by contact printing from a glass negative of the first edition. Again there should be no distortion in this document. All major revision, however, will be based upon the R.P.'s whose co-ordinates can be fixed and not upon local detail. It is therefore hoped that future revisions will not introduce errors into the map.

From the drawing of the 1/1,250 plan we are reproducing three different maps :—

(1) The published 1/1,250.
(2) The published 1/2,500.
(3) The Land Registry 1/1,250.

It has been found that some of the work drawn for the 1/1,250 plan can be used by direct photographic reduction for the 1/2,500 map. Other detail such as pecked lines and slopes is however unsatisfactory. By good fortune this detail is just that which the Land Registry prefer us to omit from their editions of the map at 1/1,250. We are accordingly drawing this detail in red. We can then obtain in a series of three exposures from the same drawing first the published 1/1,250 by retaining the black and red, and secondly the appropriate parts of the 1/2,500, and of the Land Registry map by filtering out the red during the process of photography.

The 1/1,250 map* is being drawn with a finer line than has been used of recent years for our large scale plans and it is hoped that this will be accepted as an improvement. It is to be published in square sheets of half a kilometre side which form quarter sheets of the 1/2,500 plans mentioned later. It should be noted that the margins are so designed that any four sheets can be joined together to form a complete map.

The desire of some map users for a series at 1/500 has already been mentioned. An attempt has been made to meet some of the needs of those who ask for this scale by enlarging the 1/1,250 to a scale of 1/500. The resulting map,* which of course gives no increased accuracy, may prove to be of value for certain purposes.

As the survey and production of a map at 1/1,250 is a lengthy business, experiments have been put in hand in the production of air photomosaics of the built-up areas at an approximate scale of 1/1,250. These mosaics* are being produced on the sheet lines of the new 1/1,250 plan and will have the cutting lines of the National Grid indicated in their margins. As they are assembled upon enlargements of the existing 1/2,500 plans it has been possible to include the street names. As they include an indication of the National Grid, the position of any mosaic can be easily identified by reference to the Six Inch Provisional map or the maps on smaller scales. It is hoped that these mosaics in conjunction with the Six Inch Provisional Edition will do something to fill the gap until the new survey at 1/1,250 can be published, as they can be produced at a very much earlier date.

The 1/2,500 map will continue to be the largest scale Ordnance Survey map covering the whole country, with the exception of certain moorland areas.

In the built-up areas it will be produced by reduction from the 1/1,250 plans, partly by direct photography and partly by re-drawing. It may be noted that inside the town areas there are some districts which we are not proposing to survey at 1/1,250, these will be " overhauled " at 1/2,500. It is considered that these areas are of less importance than the more urgent work in other towns and should be left until the urgent work in the country as a whole is complete.

In the rural areas the present plans will be " overhauled " and it is hoped that air survey methods now under consideration will play a considerable part in this work. Meanwhile the style of publication has been reviewed and a specimen* has been prepared for style only. In accordance with the recommendation of the Davidson Committee, the sheets will be squares of 1 kilometre side. It has been decided to number them by the full National Grid reference of their south-west corners. This enables the One Inch map to be used as an index to the series and should greatly lessen the difficulty which is sometimes experienced in the case of the present series in locating on an index the sheet upon which a particular feature is shown. The margins are arranged so that any two or four sheets can be joined together to form a single complete map. As a result of this the possibility of any particular property being divided by the sheet lines of the map is very greatly reduced.

Probably the most debatable feature in the design of the map is the method of showing the area values. Much thought has been given to this subject but a fully satisfactory answer has not yet been found. In considering this problem it is necessary to consider a little of the history of the present sheets. Originally the map was surveyed and revised on a cyclic

system in which a whole county was revised in one operation. The parcel numbers which identify the areas could accordingly be numbered serially throughout a parish and revised on the basis of a parish. Where a sheet line divided a parcel into two or more divisions the figure representing the whole area of the parcel was shown on each of the sheets concerned. Some time ago, in order to accelerate the revision of those areas where most change was taking place, the cyclic form of revision was replaced by one in which the work was concentrated on those areas changing most rapidly. As a result of this it became impossible to continue showing figures representing the whole areas of these broken parcels on each sheet. This could only be done for a given plan if all the adjacent plans had been revised. It is proposed to maintain the new plans by a system of continuous revision which means that the field documents will be kept up to date by the insertion of alterations soon after they are made and publication will take place when a certain amount of change has occurred on a plan. Under this system it is not possible to revert to the early practice of showing a whole area in the margin.

Another difficulty which has confronted us in recent years has been that owing to the rapid sub-divisions of fields in certain places, a large number of new parcel numbers are required in any given area. This has led to the use of various expedients in allotting new parcel numbers which have been difficult to devise and must be confusing to use. A method of allotting parcel numbers on a consistent basis has accordingly been devised. It is proposed that the parcel numbers shall be the two figure grid reference of the centre of gravity of the parcel. Where parcels are small it is proposed to add a letter to distinguish between two or more parcels with the same reference number. By using this method the two parts of a broken parcel will have different numbers. It is therefore for consideration whether parcels broken by a sheet edge should not be described with reference to the centre of the part of the sheet line intercepted by the parcel. It has also been suggested that it will be a convenience if an asterisk is added to the numbers of all broken parcels.

I shall be very grateful for any suggestions which may help towards the adoption of the most satisfactory method of solving this problem.

In other respects there is no radical alteration from the design of the existing 25-inch plans. It will be noted, however, that a finer line is being used for the drawing.

To recapitulate :—The order in which the post-war large scale plans are to be produced is as follows, the different items overlapping each other in a certain measure.

(1) The rapid production of the Six Inch Provisional map.

(2) The 1/1,250 mosaics.

(3) Publication of latest levelling information indexed to the National Grid.

(4) Lists of co-ordinates for use as the foundation of surveys up to a scale of 1/500.

(5) 1/1,250 plans in the built-up areas.

(6) 1/2,500 plans of the country as a whole.

A vote of thanks to Major-General Cheetham was very warmly proposed by Mr. W. C. Farnsworth, Past President, who at the same time paid tribute to the excellent work done by the Ordnance Survey. That work was of vital importance to surveyors, and it was always a great pleasure

to handle the Ordnance Survey maps. They were prepared with great accuracy and detail; in practically 100 per cent. of conveyances Ordnance Survey sheets were used.

From the ordinary practitioner's point of view as a user he was encouraged in making some criticism since General Cheetham had invited it. He welcomed the proposals for the 1/1,250 and 1/500 maps, but, like many other users, he was sorry to learn that they were to have a grid reference in place of the old parcel numbers and areas on the 25-in. map. Those numbers and areas had been used in numerous legal documents to which reference was constantly made, and he feared to envisage the work which would be necessary if re-numbering took place within the next few years. He regretted also, that in the case of broken parcels on the edge of the map, they were to have only part of the area indicated and not the whole. The old system, in addition to being more convenient, was also more economical.

Mr. W. Gibson, D.S.O., O.B.E., M.C., Fellow, in seconding the vote of thanks, also expressed keen appreciation of General Cheetham's address and of the opportunity given of obtaining some insight into the enormous amount of care and highly-skilled technical detail which had for so long gone into the preparation of the Ordnance Survey sheets. The extent to which the sheets were used by surveyors, and also by auctioneers, was perhaps not always realised. He recalled one case where for an auction, 2,000 copies of the particulars were used, which involved some 3,000 reproductions of Ordnance Survey sheets.

General Cheetham had invited comments, and he shared Mr. Farnsworth's views concerning areas and parcel numbers. He would also mention the quality of printing and the paper used for Ordnance Survey maps just before the war. His firm had found that for two adjoining areas, one map possibly was printed on fairly stout paper with good clear type, while the other was on thin paper with the colour not so good. When the two sheets were placed together and reproduced, the effect was not altogether what they would have wished. (General Cheetham later said he could not understand the reason for this, as the paper was very carefully selected and checked. The Department were unable to keep up the standard of paper for the post-war maps they were producing but he was obtaining the best paper possible in the circumstances, and although not so good as the pre-war quality, it was a good paper, and he was aiming at standardising it over a long period to avoid difficulty in mounting maps together. The new paper had been in use for two years in the printing of the 6-in. and 25-in. maps.)

Mr. R. C. Rose, Fellow, made a number of suggestions. He wished that the parish boundaries could disappear from the 1-in. maps. (This suggestion was later countered by Mr. Humphrey Ryde, Honorary Secretary, who said that in his particular work, parish boundaries were of the greatest importance on any scale map). They were, said Mr. Rose, apt to be confused with footpaths. He would also like to see the county boundaries on the 1/2,500 and on the 1/1,250 maps run over the margins and the difference between single-line and double-line railway tracks accentuated. Further, the symbols for bridle paths, aerial ropeways and pipelines were very similar. He also would like to see the 6-in. map a photo-reduction from the 25-in.

Mr. Geoffrey Green, Professional Associate, and Mr. E. A. Bartlett, a visitor, also spoke.

Mr. A. G. Harfield, Vice-President, who, in the absence of the President through illness, presided, added his own appreciation of General Cheetham's address. A chairman was expected to be impartial but, on the principle that practically every suggestion made to the Director-General was countered by a contrary suggestion from a different type of user, he would like to speak in favour of the grid system. Another point which was a great relief to him was to know that when the new sheets were joined together, they would fit.

The vote of thanks was put to the meeting, and carried with acclamation.

Major-General Cheetham, in reply, welcomed the criticisms made. He explained again the reasons why it was necessary to replace the parcel numbers on the 25-in. map with grid references, and invited alternative proposals which would get over the difficulty of finding fresh alphabets to use were the present system maintained. The new system would not involve re-numbering in future, except where parcels changed, and then the number would bear a close relation to the one it had before. The Department had also suggested placing an asterisk against any number belonging to a broken parcel.

Regarding the detailed comments on the conventional signs on the 1/2,500 map, the Department were engaged on producing it now, and he believed some of the points raised had been covered. The remainder he would note. A 6-in. photo-reduction of the 25-in. map would, he thought, not be sufficiently legible to be useful.

On the subject of the 1/1056 map of London, mentioned by Mr. Bartlett, he could not make any statement except to say that it was a difficult question which he had been discussing with the London County Council. He was fully aware that the present map had a number of faithful adherents.

The meeting then terminated.